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HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix EC-016-00006

Ecology and biodiversity

Document to inform a Habitats Regulations Assessment for the Midland Meres and Mosses Phase 2 Ramsar site (Oakhanger Moss)

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Department for Transport

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Contents

Tables

Figures

1 Introduction

1.1 Purpose of report

1.1.1 There are certain ecological sites that are designated for their international importance and to which special considerations attach under the Conservation of Species and Habitat Regulations 2017 ('the Habitats Regulations')[1], either through operation of law or government policy.

1.1.2 These sites include Special Areas of Conservation (SAC) that have been designated to protect certain species and habitats; Special Protection Areas (SPA), designated to protect certain species of wild birds; and Ramsar sites designated to protect internationally important wetland areas.

1.1.3 These sites are subject to special legal protection that imposes restrictions on a 'competent authority' from granting consent permission or authorisations for any plan or project that may affect the conservation status and integrity of these designations. In the case of the hybrid Bill, the responsible competent authority is Parliament as it is the enactment of the Bill as legislation that grants consent for the hybrid Bill scheme to be undertaken.

1.1.4 The Habitats Regulations require the competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which is likely to have a significant effect on these designated sites (either alone or in combination with other plans or projects) to make an appropriate assessment of the implications of the plan or project for potentially affected sites in view of those sites' conservation objectives.

1.1.5 There are normally two stages in the process of discharging the duties imposed by the Habitats Regulations. The first is to undertake a 'screening' exercise to determine whether there is no reasonable scientific doubt that the plan or project will be likely to have a significant effect on the site's conservation objectives. If no such likelihood is identified, the competent authority may proceed to grant consent for the plan or project in question. If, on the other hand, there remains a reasonable scientific doubt as to its effects on the integrity of the site at this stage, the competent authority must move to a second stage and undertake a more detailed assessment, commonly referred to as an 'appropriate assessment' to determine whether, having regard to any mitigation measures that are proposed to be adopted in the delivery of the scheme, there will be an adverse effect on the integrity of the site.

1.1.6 If the appropriate assessment does not identify an adverse effect on the integrity of the site, the competent authority may proceed to grant the consent. If an adverse effect cannot be

[1] *The Conservation of Habitats and Species Regulations* 2017 (2017/1012), as amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (2019/579). London, Her Majesty's Stationery Office.

ruled out, consent can only be granted on the basis that there are: no alternative solutions; there are imperative reasons of overriding public importance for the plan or project to proceed; and appropriate compensatory measures have been secured.

1.1.7 It is Parliament as legislator (and not HS2 Ltd as the prospective developer) that is the competent authority and the body which is required to comply with the requirements of the Habitats Regulations. The purpose of this Habitat Regulations Assessment (HRA) report is, however, to provide information to Parliament, based on HS2 Ltd's assessment of the hybrid Bill scheme, in order to inform and assist Parliament in complying with its obligations under the Habitats Regulations.

1.2 Background

1.2.1 Heavy goods vehicles (HGV) and other traffic associated with the construction of the Proposed Scheme will make use of the M6 where it lies in proximity to Oakhanger Moss Site of Special Scientific Interest (SSSI). It is one of 18 component SSSI of the Midland Meres and Mosses Phase 2 Ramsar site (or European site), distributed across Cheshire, Shropshire, Powys and beyond (Figure 1). The risk of pollution from this traffic prompted production of this report to inform HRA.

1.2.2 In addition, the potential effects of air pollution arising from the Proposed Scheme has required the preparation of a new document to inform the HRA for a further component of the Midland Meres and Mosses Phase 2 Ramsar site: Oak Mere SSSI (see Volume 5 Appendix: EC-016-00001).

1.2.3 This report has been prepared to provide all the necessary information for the competent authority to carry out an HRA under Regulation 63 of the Conservation of Habitats and Species Regulations 2017, as amended by the Conservation of Habitats and Species (amendment) (EU Exit) Regulations 2019[2]. It is informed by contemporary Department for Environment, Food and Rural Affairs (Defra), and Ministry of Housing, Communities and Local Government (MHCLG) guidance[3,4] and best practice. Where relevant, it takes full

[2] The amending regulations generally seek to retain the requirements of the 2017 Regulations but with adjustments for the UK's exit from the European Union. See Regulation 4, which also confirms that the interpretation of these Regulations as they had effect, or any guidance as it applied, before exit day, shall continue to do so.

[3] Department for Environment, Food and Rural Affairs (2021), *Habitats regulations assessments: protecting a European site.* Available online at: https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site.

[4] Ministry of Housing, Communities & Local Government (2019), *Planning Practice Guidance*. Available online at: https://www.gov.uk/guidance/appropriate-assessment.

account of case law including the People Over Wind[5] and Wealden[6] judgements amongst others.

[5] People Over Wind and Peter Sweetman v Coillte Teoranta (2018), High Court (Ireland), Case C-323/17 (also referred to as the Sweetman II judgement).

[6] Wealden District Council v SS Communities and Local Government, Lewes District Council and South Downs National Park Authority (2016), High Court of Justice, Case CO/3943/2016.

2 Context

2.1 Description of the Proposed Scheme

2.1.1 The Proposed Scheme comprises the construction and operation of a new high speed railway between Crewe and Manchester with a connection onto the West Coast Main Line (WCML). Oakhanger Moss is situated approximately 4.4km east of land required for the construction of the Proposed Scheme in the Hough to Walley's Green area (MA01). Here, the route of the Proposed Scheme will be approximately 10.8km long, extending from its southern connection with HS2 Phase 2a northwards in tunnel beneath Crewe and on to the Wimboldsley to Lostock Gralam area (MA02). The route of the Proposed Scheme will consist of 813m of cutting, 3.5km of embankments and 6.5km of tunnel (including portals).

2.1.2 The Proposed Scheme will result in a change to traffic flows, and associated emissions, along the M6 which lies to the east and within approximately 120m of Oakhanger Moss. The change in traffic flows is a result of HS2 construction traffic (including construction HGV and workforce vehicles) using the M6, as well as traffic re-distributed from other routes in the area by the Proposed Scheme. Construction traffic is anticipated to make use of the M6 for 13 years, from 2025 to 2038.

2.2 Site description and conservation objectives

The Midland Meres and Mosses Phase 2 Ramsar site

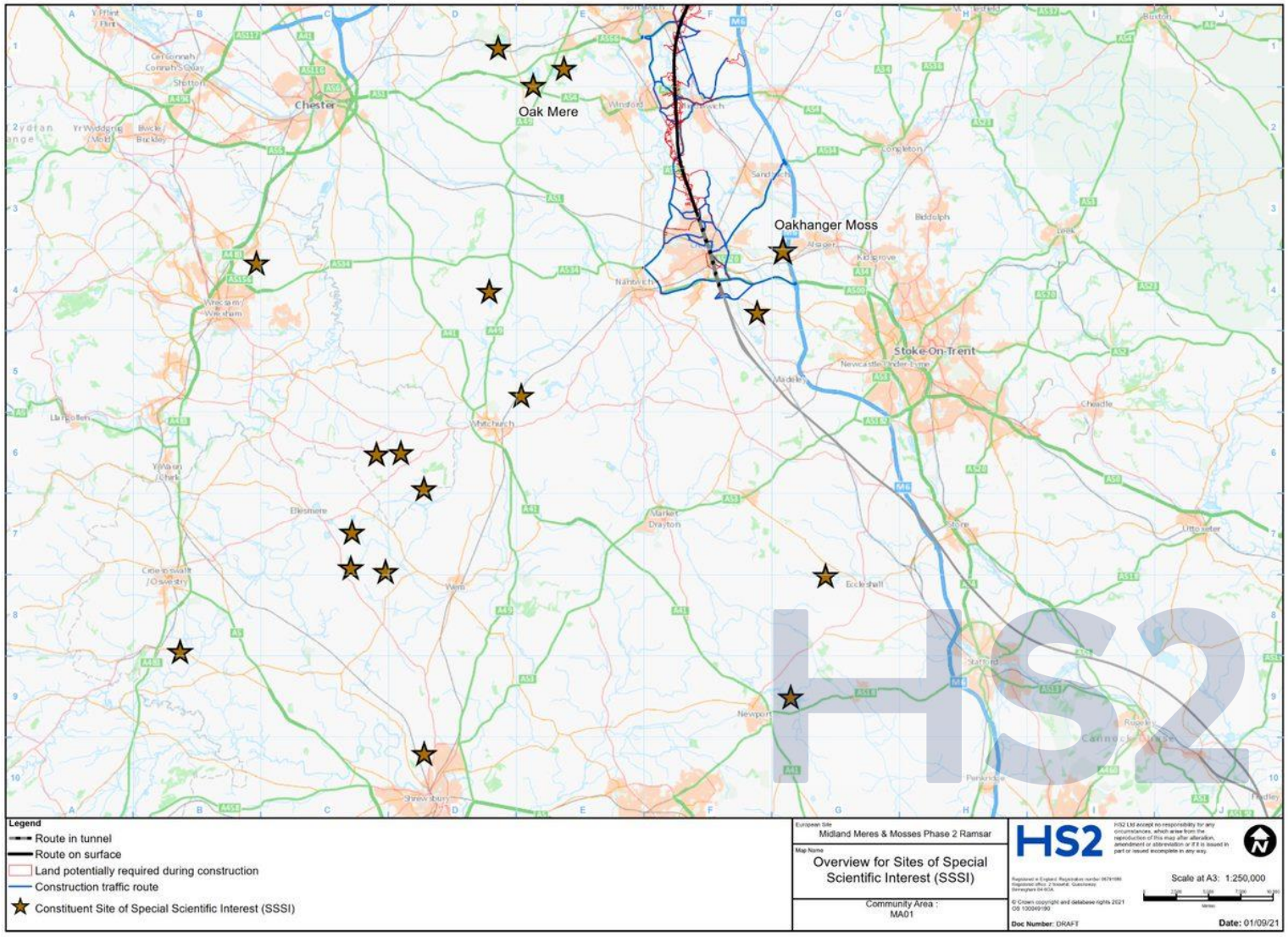
2.2.1 The Midland Meres and Mosses Phase 2 Ramsar site extends over 2,365ha across 18 discrete sites[7] distributed throughout the north-west Midlands and north-east Wales, over a land area that extends 75km from north to south and 60km from west to east (Figure 1). The Ramsar Information Sheet[8] identifies that the site qualifies for Ramsar status under criteria (1) and (2) on account of the presence of 'a diverse range of habitats from open water to raised bog' and the presence of a number of rare plants and invertebrates. Elsewhere, it describes the entire Ramsar site as comprising open water (meres) and their associated fringing habitats (for example, reed swamps, fen, carr and damp pasture) and a smaller

[7] Note that the favourable condition table for Oakhanger Moss suggests that there are 19 components and includes Rostherne Mere in the list of sites. This appears to be an error. Rostherne Mere is a standalone Ramsar site. Confirmation of this can be gained by accessing the following sites: https://designatedsites.naturalengland.org.uk/SiteGeneralDetail.aspx?SiteCode=UK11080&SiteName=&countyCode=&responsiblePerson=&unitId=&SeaArea=&IFCAArea= and https://jncc.gov.uk/jncc-assets/RIS/UK11080.pdf.

[8] Joint Nature Conservation Committee (1994), *Ramsar Information Sheet (RIS): Midland Meres and Mosses Phase 1*. Available online at: https://jncc.gov.uk/jncc-assets/RIS/UK11043.pdf.

number of nutrient poor peat bogs (mosses). However, not all features are present on all sites. Although the Ramsar-qualifying features are quite broadly described, together they encompass a distinctive group of water bodies with characteristic hydrological regimes, water chemistry and animal and plant communities. However, the Ramsar Information Sheet confirms its primary interest remains the 'wide range of lowland wetland types and successional stages within a distinct biogeographical area'.

Figure 1: Location of the Midland Meres and Mosses Phase 2 Ramsar site



Oakhanger Moss SSSI

2.2.2 As Natural England does not produce conservation objectives, supplementary advice or site improvement plans for Ramsar sites, evidence is drawn from the citation[9] for Oakhanger Moss SSSI (which was notified for broadly similar reasons) and its Favourable Condition Tables (FCT)[10]. The citation describes Oakhanger Moss as one of the shallowest water bodies in the area, though of great importance for its range of mire communities and range of successional stages, from open water to raised bog. Four different mire communities are present, each with a well-developed shrub layer. Whilst swamp dominates much of Oakhanger Moss, more diverse fen communities are found along the eastern boundary 'where nutrient levels are at their highest'. An 'incipient raised bog' (higher than the surrounding fen) is present in the centre of the site. A map showing the broad distribution of habitats is provided in Figure 2 with further detail provided in the FCT and in accompanying notes.

2.2.3 At a broad level, the FCT defines the complex of habitats at Oakhanger Moss as fen, marsh and swamp, but it is the range of mire communities that present the primary interest in terms of the Ramsar site. Although heavily wooded, it remains a valuable component of the overall Ramsar site. The FCT lists the following features:

- basin fen (lowland): M2 *Sphagnum cuspidatum/recurvum* bog pool community (or Basin fen: ombrogenous nuclei (topogenous bog));
- basin fen (lowland): M18 *Erica tetralix-Sphagnum papillosum* raised and blanket mire (or Basin fen: ombrogenous nuclei (topogenous bog));
- basin fen (lowland): S3 *Carex paniculata* swamp (or Base-poor and base-rich sump wetland);
- basin fen (lowland): S7 *Carex acutiformis* swamp (or Base-poor and base-rich sump wetland);
- basin fen (lowland): S27 *Carex rostrata-Potentilla palustris* swamp (or Base-poor and base-rich sump wetland);
- wet woodland: W1 *Salix cinerea-Galium palustre* fen woodland (or Fen woodland);
- wet woodland: W4 *Betula pubescens-Molinia caerulea* fen woodland (or Fen woodland); and
- wet woodland: W5 *Alnus glutinosa-Carex paniculata* woodland (or Fen woodland).

2.2.4 Mires and bogs occupy nutrient-poor or ombrotrophic habitats and are largely dependent on atmospheric inputs of nutrients. Consequently, they are particularly sensitive to air

[9] English Nature (1994), *Citation for Oakhanger Moss, SSSI*. Available online at: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1006639.pdf.

[10] Natural England (2015), *Conservation objectives and definitions of favourable condition for designated features of interest. Oakhanger Moss.* Available online at: https://jncc.gov.uk/jncc-assets/RIS/UK11043.pdf.

pollution with changes in species composition, abundance and distribution recorded at the community scale along with changes in morphology and reductions in growth on individual plants.

Conservation objectives

2.2.5 In lieu of formal Ramsar conservation objectives, the targets set out in the FCT have been considered. Whilst it is acknowledged that the FCT was designed for monitoring purposes and not HRA, and any thresholds in the FCT refer primarily to site management and monitoring, they identify key features and aspirations which other plans or projects should address, and which can be considered with caution for the purposes of this HRA. Therefore, the FCT is regarded as a reasonable surrogate for Ramsar conservation objectives for the site. An extract of the most relevant higher-level targets from the FCT is provided below, but reference to the entire document is encouraged for additional detail.

Habitat extent

2.2.6 To maintain the designated features in favourable condition, which is defined in part in relation to a balance of habitat extents (extent attribute). Favourable condition is defined at this site in terms of the site-specific standard for Lowland fens: There should be no reduction in the total combined extent of wetland in relation to the established baseline.

Site-specific definitions of favourable condition for fen, marsh and swamp

2.2.7 To maintain the fen, marsh and swamp at Oakhanger Moss in favourable condition, with particular reference to relevant specific designated interest features:

- Basin fen – Habitat extent: There should be no reduction in the total combined extent of wetland, including all associated pools and lagg fen, in relation to the established baseline;
- Wet woodland – Habitat extent: At least current area (as surveyed in 2014) of recent semi-natural stands maintained, although their location may alter; and
- Basin fen – Habitat composition: There should be no loss of the component types M2, M18, S3, S7 and S27. Balance between open fen and wet woodland W1, W4 and W5 maintained at current levels and in roughly the current locations. Community and habitat transitions are maintained at current levels and in current locations.

2.2.8 While it is clear the above communities represent elements of the 'diverse range of habitats' described in the Ramsar Information Sheet, it is noted that there is no specific reference to the assemblage of rare plants and invertebrates provided in either the FCT or SSSI citation. Consequently, these are considered to be absent, and no consideration is given to these in this report to inform HRA. If, however, they are shown to be present, their requirements are considered to be satisfactorily addressed by the assessment of the supporting habitats.

Condition assessment

2.2.9 The most recent formal condition monitoring assessment of Oakhanger Moss was carried out by Natural England in 2012[11], although this pre-dated, and so would not have taken account of, the objectives embedded in the current FCT. This found that the entire site was considered to be in an 'unfavourable declining' condition. It describes the site (including the mire) as 'very dry', with both the wetland and woodland communities failing their respective objectives due to the lack of positive, or presence of negative, indicator species. It added that management measures did 'not seem to be effective', concluding that the key interest feature (basin fen (lowland), M18) had been lost in 2007 and, though subject to restoration management, was 'unlikely to reappear'. In addition, Natural England confirmed that the woodland (W10) and bracken community along the edges of Oakhanger Moss were only included within the designated site as a 'hydrological buffer'.

2.2.10 However, the FCT includes site visit notes that describe Oakhanger Moss in 2007 and 2014, respectively, after scrub had been removed to restore the mire communities (referred to above):

- in 2007, the site was regarded as being in 'unfavourable recovering' condition. However, all M18 communities were recorded as 'lost'. Enrichment of the site was put down to nutrient rich surface waters flowing through the site; and
- in 2014, the site was regarded as 'very dry', despite a wet summer, and the dams did not appear to be working. The area cleared of scrub in 2007 was reverting to woodland. As in 2012, it failed its FCT objectives.

2.2.11 While the most recent assessment was carried out seven years ago, there is little to suggest circumstances have changed and, overall, it is assumed that Oakhanger Moss remains in an unfavourable condition and vulnerable to external influences. Given this, the objectives are interpreted not as 'to maintain' but 'to restore' the qualifying features.

2.3 Case law

2.3.1 In recent years, there have been a number of important rulings made by both domestic and European courts which could influence this HRA. The most relevant are described below.

People Over Wind judgement

2.3.2 The People Over Wind judgement (2017) drew a distinction between incorporated mitigation measures which are represented by the essential characteristics of a scheme and those added specifically to avoid or reduce an impact on qualifying features. The former, such as

[11] Natural England, *Condition of SSSI Units for Site Oakhanger Moss SSSI*. Available online at: https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S1006639&ReportTitle=Oakhanger%20Moss%20SSSI.

the general alignment of HS2, can be considered at screening whereas the latter are reserved for consideration in an appropriate assessment.

Wealden judgement

2.3.3 The Wealden judgement (2017) clarifies a limitation on the use of thresholds when used to rule out the likelihood of significant effects alone or in combination with other plans or projects, specifically the use of Annual Average Daily Traffic (AADT) figures. The Court concluded that where the likely effect of an individual plan or project does not itself exceed the threshold of 1,000 AADT, its impact must still be considered alongside the similar effects of other plans and projects to assess whether the combined effect could be significant. Where the in-combination effect is greater than this threshold, an appropriate assessment is typically required. In line with Regulation 63(3), the need to consider in-combination assessment, is also carried through into the appropriate assessment if one is necessary.

Dutch Nitrogen case

2.3.4 Here, the Court of Justice of the European Union (CJEU)[12] confirmed that an appropriate assessment is not to take into account the future benefits of mitigation measures if those benefits are uncertain, including where the procedures needed to accomplish them have not yet been carried out or because the level of scientific knowledge does not allow them to be identified or quantified with certainty.

Compton case

2.3.5 This case[13] explored how exceedances of the critical loads should be assessed. The Court ruled that when considering what approach is required in order to conclude no adverse effect on the integrity of a site:

> 'That could not be answered, one way or the other, by simply considering whether there were exceedances of critical loads or levels, albeit rather lower than currently. What was required was an assessment of the significance of the exceedances for the SPA birds and their habitats …'.

[12] Coöperatie Mobilisation for the Environment UA, Vereniging Leefmilieu v College van gedeputeerde staten van Limburg, College van gedeputeerde staten van Gelderland, European Court of Justice, (C 293/17, C 294/17) [2019] Env. L.R. 27 at paragraph 30.

[13] Compton Parish Council, Julian Cranwell and Ockham Parish Council v Guildford Borough Council, SoS for Housing, Communities and Local Government (2019), High Court of Justice, EWHC 3242. CO/2173,2174,2175/2019.

3 Likely significant effect

3.1 The likely significant effects test

3.1.1 Regulation 63(1) identifies whether the proposed development will result in a 'likely significant effect … (either alone or in-combination)' on a European site. An 'in-combination' assessment is only required where an impact is identified which would not result in a significant effect on its own but where significant effects may arise when combined with other plans or projects. The screening test is seen only as a 'trigger'[14] and identifies whether the greater scrutiny of an 'appropriate assessment' is necessary. Case law informs how Regulation 63(1) should be interpreted, as follows:

- 'significant' means 'any effect that would undermine the conservation objectives of a European site'[15];
- 'likely' is a low threshold and simply means that there is a 'risk' or 'doubt' regarding such an effect that 'cannot be excluded on the basis of objective information'[16]; and
- [it] '… is not that significant effects are probable, a risk is sufficient'… and there must be 'credible evidence that there was a real, rather than a hypothetical, risk'[17].

3.2 Potential impacts on Oakhanger Moss

3.2.1 Oakhanger Moss lies a considerable distance (4.4km) away from any construction work associated with the Proposed Scheme. Therefore, the only credible risk results from air pollution associated with the changes in vehicle movements caused by the Proposed Scheme. Consequently, this single factor is addressed below.

[14] Bagmoor Wind Limited v The Scottish Ministers (2012), CSIH 93.

[15] Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij (2004), European Court of Justice, C-127/02 (referred to as the Waddenzee judgement) at paragraphs 44, 47 and 48.

[16] Waddenzee at paragraphs 44 and 45.

[17] Peter Charles Boggis and Easton Bavants Conservation v Natural England and Waveney District Council, High Court of Justice Court of Appeal case C1/2009/0041/QBACF [2009] EWCA Civ. 1061 at paragraphs 36 and 37.

3.3 Screening test on Oakhanger Moss

Methodology

3.3.1 The assessment of air pollution is influenced by established best practice provided by Highways England (the Design Manual for Roads and Bridges (DMRB))[18], Natural England[19] and the Institute for Air Quality Management (IAQM)[20]. Together, these make clear that vehicle emissions can increase the airborne concentration of nitrogen oxides (NO_x) and the subsequent rate of nitrogen deposition. The latter can lead to nutrient enrichment and, over time, not only hinder the growth, abundance and distribution of (especially lower) plants, but can also prompt the growth of ruderal species which can lead to changes in structure and function of qualifying habitats. Whilst certain species and communities are less susceptible to harm than others, nitrogen deposition can also exacerbate the effects of other factors such as climate change or pathogens leading to negative, synergistic effects.

3.3.2 The rate of nitrogen deposition falls quickly in the first few metres from the roadside before gradually levelling out; beyond 200m, it becomes difficult to distinguish from background levels. In other words, impacts at 10m, 50m or more can be very different from those at the roadside, and beyond 200m significant effects can be ruled out.

3.3.3 Assessment of nitrogen deposition is required for ecologically sensitive sites within 200m of roads where one or more of the following DMRB criteria are met:

- change in road alignment by 5m or more;
- change in daily traffic flows by 1,000 vehicles or more as AADT;
- change in daily flows of HDV[21] by 200 AADT or more;
- change in daily average speed by 10kph or more; or
- change in peak hour speed by 20kph or more.

3.3.4 It can be seen, therefore, that the additional nitrogen deposition that might arise from increased traffic is only likely to be significant where: a European site lies within 200m of a road; and, traffic flows are expected to increase (or other changes listed in paragraph 3.3.3 above are apparent); and, a feature is known to be sensitive to such effects. Should these

[18] Highways England, Transport Scotland, Welsh Government & Department for Infrastructure (2019), *Design Manual for Roads and Bridges LA105 Air quality*.

[19] Natural England (2018), *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations – v1.4 Final*. Available online at: http://publications.naturalengland.org.uk/file/5431868963160064.

[20] Holman et al (2019), *A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0*. Institute of Air Quality Management, London. Available online at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2019.pdf.

[21] HDVs are defined as those with an unladen weight of greater than 3.5 tonnes, including large vans; medium goods vehicles (rigid and artic); heavy goods vehicles (rigid and artic) and buses/coaches.

criteria be met, best practice recommends that the ecological characteristics of the site should be explored and, if necessary, traffic and/or air quality assessments of traffic flows carried out to evaluate any impacts during construction or subsequent operation as appropriate.

3.3.5 The ecological characteristics of a site are derived from the formal citations, condition assessments, conservation objectives, FCT, site improvement plans (SIP), supplementary advice and any other surveys and management plans where available. Traffic flows are assessed by calculating AADT figures. The latter introduces further thresholds and, where changes in flows (alone and in-combination) are less than 1,000 AADT[22] or 200 HDV, the risk of a significant effect can be ruled out and no further assessment is required. Should flows exceed these values, air quality analysis is required. Here, impacts are assessed by calculating the relative contribution of the plan or project in relation to the relevant critical level for NO_x and the critical loads for nitrogen deposition for the individual qualifying features. The air quality analysis typically models the rates of deposition at fixed points on a 200m transect extending from the roadside.

3.3.6 The critical level for NO_x is fixed and is expressed as a concentration: 30µg/m^3. It is a precautionary threshold below which there can be confidence that harmful effects on vegetation will not arise, and further assessment may not be necessary. If exceeded, assessment of critical loads is required. The critical loads for nitrogen deposition vary and are specific to each qualifying feature. These are presented as a range of values (expressed as a rate, e.g. 10kg N/ha/yr - 20kg N/ha/yr) and typically, as a precautionary approach, only the lowest value is used (unless there are compelling reasons to do otherwise) as this will emphasise any negative outcomes.

3.3.7 Should nitrogen deposition increase by less than 1% of the lower critical load, likely significant effects can be ruled out. However, should the 1% threshold be exceeded, a significant effect cannot be ruled out and an appropriate assessment will be required. It should be noted that the 1% threshold, set at two orders of magnitude below the critical load, is highly precautionary. Furthermore, an exceedance of the threshold does not mean that a significant (or adverse) effect will automatically occur, it only represents a trigger that prompts further assessment. Indeed, this emphasises that assessment is not about establishing a simple mathematical relationship. Account must be taken of the type of habitats (some are more resilient than others) and the distribution of the designated features, as not all will be distributed evenly across sites, and other factors may be at play.

3.3.8 Natural England adds that where the existing background levels of NO_x or rates of deposition already exceed these values prior to implementation of a plan or project, the conservation objectives shift from seeking to maintain the condition of the qualifying features to aiming to restore them to a favourable conservation status. This reflects the

[22] These values are utilised as there is evidence to show that these equate approximately to a 1% change in critical loads (see paragraph 4.2.4).

greater challenge of restoring a site that could already be suffering harm from air pollution. It also makes clear that the impact assessment should focus on those objectives related to the structure and function of a site; those objectives most relevant to the impacts that could arise from air pollution are provided in Section 2.2 above.

3.3.9 While assessment should, in the first instance, evaluate the plan or project in isolation, the Wealden decision makes clear that should insignificant outcomes arise alone, the outcomes should also be assessed in combination with other plans or projects. This test is also carried through to the appropriate assessment (if one is required). As Oakhanger Moss also forms one of the 18 discrete components of the Midland Meres and Mosses Phase 2 Ramsar site (which, in straightforward terms, is regarded as the sum of its parts), there is a separate need to assesses the impact of air pollution on all other components as well.

3.3.10 To determine whether a formal screening exercise is required, this HRA firstly assesses the preliminary criteria: proximity of the European site to a road and the volume of anticipated traffic. If necessary, it then screens the construction and/or operational phase either alone or in-combination. An appropriate assessment follows subsequently, if required. An assessment of any impacts on the entire Midland Meres and Mosses Phase 2 Ramsar site follows.

Initial assessment

Background

3.3.11 Key information is presented in Annex A which summarises the associated air quality analysis. The following assessment draws on best practice (from Natural England and DMRB, see paragraph 3.3.1) and utilises selected information from Annex A though reference to the latter is encouraged.

Proximity

3.3.12 Oakhanger Moss lies approximately 120m from the M6, well within the 200m threshold. Consequently, a traffic assessment is required.

Traffic assessment

3.3.13 The Proposed Scheme will result in a change to traffic flows, and associated emissions, along the M6 which lies to the east and within approximately 120m of Oakhanger Moss. The change in traffic flows is a result of HS2 construction traffic (including construction HGV and workforce vehicles) using the M6, as well as traffic re-distributed from other routes in the area by the Proposed Scheme.

3.3.14 Traffic analysis (see Table A2 and Table A6 of Annex A) indicates that the construction of the Proposed Scheme will result in traffic flows that exceed the screening thresholds (of 200 HDV or 1,000 for all vehicles), both alone and in combination with other plans or projects.

Consequently, likely significant effects cannot be ruled out alone or in-combination, and a formal screening exercise and air quality assessment of traffic flows will be required. This is provided below.

3.3.15 In contrast, this analysis confirms that the Proposed Scheme will not change traffic movements in the operational phase and, therefore, no further assessment of that component is required. No other criteria are triggered.

3.4 Screening assessment (construction) alone on Oakhanger Moss

Air quality assessment of traffic flows

3.4.1 The air quality assessment of traffic flows at Oakhanger Moss has been undertaken in accordance with the Volume 5, Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report (SMR) and is summarised in Annex A.

3.4.2 The only road that triggered the AADT thresholds under this scenario was the M6. The change in traffic flows is a result of HS2 construction traffic (including construction HGV and workforce vehicles) using the M6, as well as traffic re-distributed from other routes in the area by the Proposed Scheme. Given the orientation of the site and the M6, only one air quality modelling transect (represented by yellow dots) was employed, situated at a location in the north-eastern corner to capture the worst possible outcome (Figure 2). However, the outcome of the analysis should be applied to the entire eastern half of Oakhanger Moss.

3.4.3 Reflecting the distance of Oakhanger Moss from the motorway, the transect initially crosses agricultural land and a minor road before entering the site at a distance of 123m and remaining within it to the full extent of the transect.

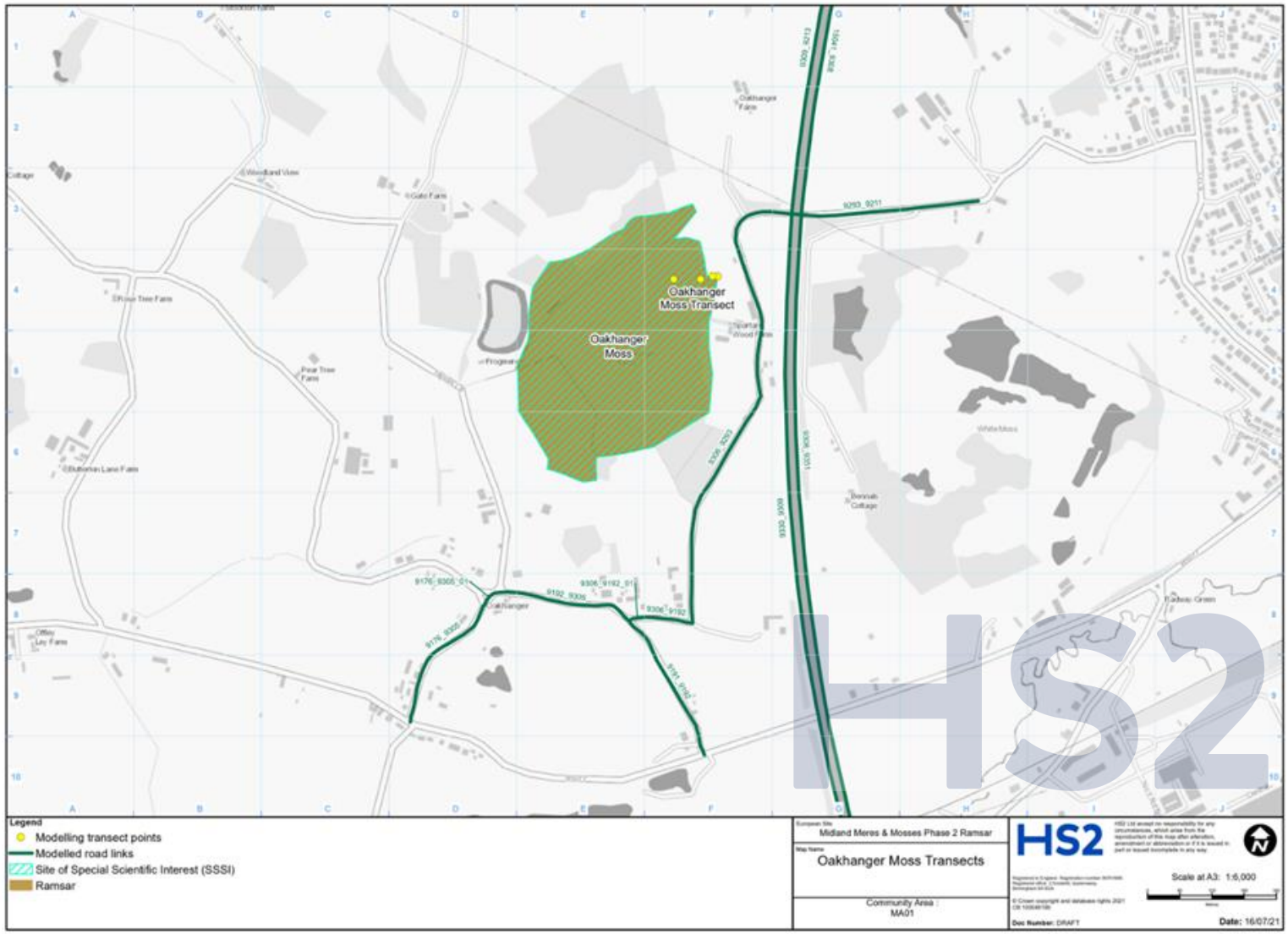
3.4.4 Drawing on the type and distribution of habitats provided in Annex 1 of the FCT, and evidence derived from the Air Pollution Information System (APIS)[23], the habitat types found within 200m of the M6 were identified in broad terms as woodland and lowland raised bog (used for the remainder of this HRA as a collective term for the various mire and bog communities). These have critical loads of 10kgN/ha/yr - 20kgN/ha/yr and 5kgN/ha/yr - 10kg N/ha/yr respectively. Following best practice, the lower values of each critical load would have been used in the air quality analysis. This is a precautionary measure that will emphasise any negative outcomes. Key outputs are summarised below and in the Air Quality Report (Annex A). The broad distribution of habitats is shown in Figure 2.

3.4.5 However, certain components of the woodland within the site were included in the designation as a 'hydrological buffer' and do not, therefore, represent a qualifying feature.

[23] UK Centre for Ecology and Hydrology (2021), *Air Pollution Information System*. Available online at: http://www.apis.ac.uk.

Despite this, the entire site was modelled as the more vulnerable lowland raised bog utilising the the 5kg N/ha/yr critical load.

Figure 2: Location of M6, Oakhanger Moss and the modelled transect



3.4.6 The air pollution assessment used traffic data based on an estimate of the average daily flows in the peak year during the construction period and adopts vehicle emission rates and background pollutant concentrations from the first year of construction. It should be noted that the air quality model takes a conservative approach and assumes that the highest flows in any one year are applied to the entire construction period. In reality, there will be considerable periods, perhaps years, where traffic flows and hence nitrogen deposition are less than this. However, the approach adopted meets the precautionary principle embedded in the Habitats Regulations.

3.4.7 Table A4 of Annex A describes the change in NO_x concentrations brought about by the Proposed Scheme during construction alone. Whilst this is not repeated here, it interpreted the data as follows:

> 'NO_x concentrations at the Oakhanger Moss are predicted to be within the air quality standard in all scenarios.'

3.4.8 Despite this positive outcome, an assessment of nitrogen deposition was also made (see Table A5 of Annex A) and repeated below in Table 1[24].

Table 1: Nitrogen deposition (Proposed Scheme, alone)

Distance to road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
122	32.49	31.80	31.81	0.01	5	0.2%
155	32.27	31.70	31.71	0.01	5	0.2%
205	32.04	31.59	31.60	0.01	5	0.1%

3.4.9 With reference to this data, Annex A states:

> 'Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. The change in nitrogen deposition due to the Proposed Scheme is predicted to be less than 1% of the lower critical load and therefore not significant.'

3.4.10 This evidence shows clearly that at all modelled points within Oakhanger Moss the rate of nitrogen deposition brought about by the Proposed Scheme alone, fails to exceed the 1% threshold. Drawing on best practice, likely significant effects can therefore be ruled out alone. Whilst no further assessment of the impact alone is required, the need remains to consider potential impacts in-combination.

[24] Note that all tables in this HRA are drawn from Annex A. While minor changes have been made to the layout and naming of columns, the data remains unchanged.

Screening opinion for Oakhanger Moss alone

3.4.11 The Proposed Scheme has been screened for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that there is no credible risk that nitrogen deposition during the construction phase could undermine the conservation objectives of Oakhanger Moss and likely significant effects (alone) can be ruled out. Therefore, it is also considered there is no need for an appropriate assessment (alone).

3.5 Screening assessment (construction) in-combination on Oakhanger Moss

Rationale

3.5.1 Although likely significant effects during construction alone were ruled out in paragraph 3.4.11, an assessment of the Proposed Scheme during construction in combination with other plans or projects is also required. As the Directive[25] makes clear, the in-combination test seeks to identify cumulative effects, and consequently they are limited to those that can affect the same feature. Therefore, the in-combination assessment was limited to those plans or projects that had the potential to increase nitrogen deposition on the qualifying features of Oakhanger Moss; all other potential impacts were ruled out. The range and scope of in-combination assessments has been addressed in various settings; relevant examples include:

- Regulation 63(2) states:

  > [the developer] 'must provide such information as the competent authority may reasonably require for the purposes of such an assessment.'

- Furthermore, on 22 April 2005, the European Commission stated, in response to a parliamentary question (P-0917/05):

  > 'The [in-] combination provision must be applied in a manner that is proportionate…'

- In Foster and Langton[26], the Court stated:

  > 'There is no basis to carry out an assessment of the in-combination effects when there are no effects to take into account.' (paragraph 36).

[25] *Directive 92/43/EEC of the European Parliament and of the Council of 21st May 1992 on the conservation of natural habitats and of wild fauna and flora aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements.* Strasbourg, European Parliament and European Council.

[26] R (Foster and Langton) v Forest of Dean DC and Homes and Communities Agency (2015), High Court of Justice, EWHC 2684 (Admin) (2015).

3.5.2 This evidence has determined the need for and scope of any in-combination assessment required for this European site as explained in Section 4.2.

Methodology

3.5.3 In-combination effects are largely taken into account in the traffic data used for the assessment which incorporates likely changes brought about by other proposed and committed developments. The approach to this assessment, which has been agreed with Natural England, is provided in Section 2 of Annex A.

3.5.4 In order to comply with the Wealden decision, the scope of the in-combination assessment has been limited to those plans or projects that could contribute to a cumulative increase in air pollution at Oakhanger Moss. Annex A details how development that could cause traffic emission related in-combination effects have been accounted for within the traffic data used in the air quality assessment of traffic flows. Searches were also carried out for the following non-traffic related emission sources (which are also included in the air quality model) within a 5km radius:

- combustion and energy >1MW;
- farming, livestock and poultry (any);
- waste, e.g. landfill gas (any); and
- minerals activities.

3.5.5 This is considered to be reasonable and proportionate and meets the expectations laid down in Section 4.48 of Natural England's guidance[19].

Air quality assessment of traffic flows

3.5.6 The M6 remains the only road under scrutiny. The same broad approach employed in the assessment alone (above) was utilised as modified by the need to consider other plans or projects. However, no non-road plans or projects have been identified that require further consideration within the in-combination assessment. As with the assessment of the Proposed Scheme alone, changes in NO_x are summarised first followed by an assessment of nitrogen deposition.

3.5.7 Table A8 of Annex A describes the change in NO_x concentrations brought about by the Proposed Scheme during construction in combination with other plans or projects. Whilst this is not repeated here, it interpreted the data as follows:

> 'NO_x concentrations at the Oakhanger Moss are predicted to be within the air quality standard in all scenarios.'

3.5.8 Despite this positive outcome, an assessment of nitrogen deposition was also made (see Table A9 of Annex A) and repeated below in Table 2.

Table 2: Nitrogen deposition (Proposed Scheme, in-combination)

Distance to road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
		2025 without the Proposed Scheme	2025 with the Proposed Scheme			
123	32.49	31.76	31.81	0.05	5.0	1.2
155	32.27	31.65	31.71	0.06	5.0	1.0
205	32.04	31.56	31.60	0.04	5.0	0.8

3.5.9 With reference to this data, Annex A states:

> 'Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. Predicted nitrogen deposition rates in 2025, with the Proposed Scheme, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition between the 2025 do nothing scenario and with the Proposed Scheme scenario are greater than 1% of the relevant critical up to approximately 155m from the nearest road. Potentially significant effects are therefore predicted …'

3.5.10 Table 2 shows clearly that the consideration of other plans or projects increases the rate of nitrogen deposition from the site boundary to a point 155m from the M6. Although changes are modest, from a maximum of 0.05kg N/ha/yr to 0.04 kg N/ha/yr at 205m, the 1% threshold is clearly exceeded, and a likely significant effect (in-combination) cannot be ruled out.

3.5.11 Given that Table 2 above also confirms that background rates of nitrogen deposition currently exceed the critical loads for all qualifying features at the site, allied with the unfavourable declining condition of Oakhanger Moss, the conservation objectives must shift from the maintenance of the qualifying features to their restoration to a favourable conservation status, to 'restore the designated features to favourable condition …' (see Section 2.2).

Screening opinion for Oakhanger Moss in combination

3.5.12 The Proposed Scheme has been screened for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that there is a credible risk that nitrogen deposition during the construction phase could undermine the conservation objectives of Oakhanger Moss and likely significant effects (in-combination) cannot be ruled out. Therefore, it is also considered that an appropriate assessment is required (in-combination).

4 Appropriate assessment

4.1 The appropriate assessment test

4.1.1 The appropriate assessment is defined in Regulation 63(5). The following definitions are applied as necessary to the subsequent assessment of likely significant effects.

4.1.2 Regulation 63(5) states where a project is 'likely to have a significant effect alone or in combination', it can only be consented if the competent authority can ascertain (following an appropriate assessment) that it 'will not adversely affect the integrity of the European site'. Drawing on Waddenzee, the 'in-combination test' is also carried forward into the appropriate assessment.

4.1.3 In Sweetman[27], 'integrity' is defined as:

> '... the lasting preservation of the constitutive characteristics of the site ... whose preservation was the objective justifying the designation of the site'.

4.1.4 In the Advocate General's opinion on the above case (Sweetman)[28], she stated that a plan or project involving '... some strictly temporary loss of amenity which is capable of being fully undone ...' would avoid an adverse effect on the integrity of a site. This was supported by the Court which ruled that '... the lasting and irreparable loss...' of part of a European site would represent an adverse effect on its integrity.

4.1.5 In Planning Practice Guidance[4] 'integrity' is described as:

> '... the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated.'

4.1.6 The burden of proof is made clear in Waddenzee and where:

> '... doubt remains as to the absence of adverse effects ... the competent authority will have to refuse authorisation'[29] [and] 'that is the case where no reasonable scientific doubt remains as to the absence of such effects'[30].

[27] Sweetman v An Bord Pleanála (C 258-11) [2014] PTSR 1092 at paragraph 39.

[28] Minister for the Environment, Heritage and Local Government v An Bord Pleanala (2013), Sweetman reference for a preliminary ruling from the Supreme Court of Ireland, Peter Sweetman Ireland Attorney General (together with the opinion of the Advocate General delivered on 22 November 2012). C-258/11.

[29] Waddenzee at paragraph 57.

[30] Waddenzee at paragraph 59.

4.1.7 However, absolute certainty is not required. In Champion, while referring to Advocate General Kokott in Waddenzee at paragraph 107, the Supreme Court found that:

> '... absolute certainty' is not required as: '... the necessary certainty cannot be construed as meaning absolute certainty since that is almost impossible to attain ...'.

4.2 Appropriate assessment in-combination

Assessment

4.2.1 The screening assessment has shown that whilst likely significant effects can be ruled out alone, they could not be ruled out in combination with other plans or projects and that an appropriate assessment was required (in-combination). This is addressed below.

4.2.2 For lowland raised bog, an exceedance of the 1% threshold (1.2%) was predicted at the boundary of Oakhanger Moss though this declined over distance to first equal the threshold at 155m before falling below this trigger level at 205m at the westernmost extent of the transect. Although measured along a single transect, it should be noted that this impact will be experienced along the entire eastern component of Oakhanger Moss. This relatively rapid decline in deposition is a consequence perhaps of the heavily wooded nature of Oakhanger Moss which reduces rates quickly over a much shorter distance than a more open landscape.

4.2.3 However, it should be noted that these measurements relate to the categorisation of this part of the site as lowland raised bog or mire. Reference to the habitat maps in the FCT clearly indicate that, broadly speaking, land from the site boundary to approximately 150m lies within woodland that comprises a hydrological buffer which does not represent a qualifying feature. In circumstances like this, it is reasonable to adopt the higher range of the critical load for woodland (i.e. 20kg N/ha/yr). If adopted, this would result in a maximum change of just 0.3% of the critical load, well below the threshold for a possible significant effect. Accordingly, impacts from nitrogen deposition in this zone can be dismissed.

4.2.4 Beyond approximately 150m though, the critical load for lowland raised bog clearly applies. At this distance though, the rate of nitrogen deposition has fallen to meet the 1% threshold. As explained in Section 3.3, this is a highly precautionary threshold set two orders of magnitude below the critical load where the risk of a significant effect might arise – it should not be interpreted that a harmful effect would occur. Even though this section of the transect lies beyond the hydrological buffer and just encompasses parts of the M18 community, nitrogen deposition continues to decline until it falls below the 1% threshold at 205m.

4.2.5 At these levels of deposition, it is implausible that nitrogen deposition rates that meet the threshold will compromise the achievement of the conservation objectives 'To restore the designated features to favourable condition...'. Even with reference to the more applied objectives in the FCT, which focus on the species composition of the various bog

communities, it remains implausible that the objectives to secure the species composition, distribution and abundance could be compromised. This outcome still applies even though the site remains in an unfavourable condition.

4.2.6 In addition, the third, fourth and fifth columns of Table 1 show that at all transect points the rate of nitrogen deposition will be lower in 2029 than in 2018 even with the Proposed Scheme. This highlights the generally improving trend in air quality. The Proposed Scheme will not reverse this trend though will marginally slow down the rate of improvements indicated by the data at 123m where a difference of 0.06kg N/ha/yr is shown. Although the mire and bog communities are fragile and their ombrotrophic habitat particularly vulnerable to eutrophication from nitrogen deposition, rates such as those predicted cannot be considered to represent a credible threat. Its unfavourable condition is important as this can be regarded to emphasise its vulnerability but even so, it is considered effects on the ground would neither be visible nor measurable.

4.2.7 Further confidence in this outcome can be drawn from the knowledge that the modest contribution to the cumulative traffic flows made by traffic associated with the Proposed Scheme will be temporary and will be removed entirely in thirteen years. In this instance, reference to section 5.43 of Natural England's guidance[19] is relevant and states: '... it may be possible to consider some increases as temporary and reversible, which would be unlikely to undermine site objectives.' Such an approach would also be supported by case law including Sweetman and Waddenzee (see Section 4.1).

4.2.8 Consequently, it is considered there is no reasonable scientific doubt that adverse effects on the integrity of Oakhanger Moss in-combination can be avoided, and there is no need for mitigation.

Impacts on other components of the Midland Meres and Mosses Phase 2 Ramsar site

4.2.9 It is recognised that as the Ramsar site comprises multiple components, should the Proposed Scheme, following an appropriate assessment, cause adverse effects to arise on one, this could require the consideration of whether the Proposed Scheme or other plans or projects had caused adverse effects to arise on other components. The cumulative impact of these could result in a greater adverse effect. However, as it is considered that adverse effects have been ruled out at Oakhanger Moss and, in a separate HRA for the one other component of the Ramsar site, Oak Mere, which was also considered at risk from air pollution, there is no potential for any cumulative impact with any other plans or projects. Therefore, it is considered there is no need for any further assessment.

4.3 Integrity test for Oakhanger Moss

4.3.1 The Proposed Scheme has been subjected to an appropriate assessment for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that the

competent authority is able to ascertain that an adverse effect on the integrity of the European site can be ruled out in-combination.

5 Conclusions

5.1.1 This document provides all the necessary information for the competent authority to carry out an HRA for the purposes of Regulation 63 of the Habitats Regulations 2017, as amended, should one be required. The outcomes allow the following conclusions to be drawn:

- it is considered there is no credible risk that nitrogen deposition, during construction of the Proposed Scheme alone, could undermine the conservation objectives of Oakhanger Moss and likely significant effects could be ruled out (alone). Therefore, it is considered there is no need for an appropriate assessment (alone);
- it is considered there is a credible risk that nitrogen deposition, during construction of the Proposed Scheme in combination with other plans or projects, could undermine the conservation objectives of Oakhanger Moss and likely significant effects could not be ruled out (in-combination). Therefore, it is considered an appropriate assessment (in-combination) is required; and
- it is considered the appropriate assessment is able to ascertain, beyond reasonable scientific doubt, that adverse effects (in-combination) on the integrity of Oakhanger Moss could be ruled out; and it is considered there is no need for any further assessment.

Annex A: Additional air quality information to inform a Habitats Regulations Assessment

1 Purpose

This Annex provides additional air quality information in relation to impacts from vehicle emissions to support the Document to inform a Habitats Regulations Assessment for the Midland Meres and Mosses Phase 2 Ramsar site (Oakhanger Moss SSSI).

This report assesses the impact of air pollution on the Oakhanger Moss Site of Special Scientific Interest (SSSI) component of the Midland Meres and Mosses Phase 2 Ramsar site (Oakhanger Moss). For simplicity, it is referred to as Oakhanger Moss throughout the rest of this report except where specific mention is required of the Ramsar site.

2 Scope, assumptions and limitations

The scope, assumptions and limitations for the air quality assessment are set out in full in Volume 1 (Section 8), in the Environmental Impact Assessment SMR (see Volume 5: Appendix CT-001-00001) and accompanying SMR Technical note – Air quality: Guidance on the assessment methodology.

Key elements in relation to the assessment of vehicle emissions on ecologically sensitive sites are:

- screening of traffic data using the criteria set out in the SMR which is based on DMRB criteria[18], to identify where assessment is required;
- these criteria are the following for assessing the impacts of the scheme alone:
  - change in road alignment by 5m or more;
  - change in daily traffic flows by 1,000 vehicles or more as AADT;
  - change in daily flows of Heavy Duty Vehicles (HDV) by 200 AADT or more;
  - change in daily average speed by 10kph or more; or
  - change in peak hour speed by 20kph or more.
- these criteria are the following for assessing the impacts of the scheme in-combination with other plans and projects:
  - change in daily traffic flows by 1,000 vehicles or more as AADT; or
  - change in daily flows of HDV by 200 AADT or more.
- ecological receptors included in the air quality assessment are designated sites with habitats sensitive to NO_x deposition. These could include, SAC, SPA and Ramsar sites;
- transects have been used within a designated site with modelled points at 0m, 10m, 20m, 30m, 40m, 50m, 75m, 100m, 150m and 200m from the edge of the road. However, specific modelling points will be subject to the orientation of the site and nearby vehicle emission sources;
- a deposition velocity relevant to the habitat of each site has been used, as detailed in the IAQM ecological guidance[20]. Data on nitrogen deposition has been taken from the most recent information available on the APIS[23] website. No reduction in future background deposition rates has been applied;
- the following scenarios are assessed:
  - baseline;
  - selected year(s) within the construction period for the assessment of the effects of construction. The year(s) of assessment are selected based on the worse case peak period during the construction programme and on when significant effects might be expected; and
  - an operational scenario will be assessed for the first full operational year after construction is completed.

- for each assessment year, both the scenario without the Proposed Scheme in place and the scenario with the Proposed Scheme in place will be modelled. This comparison is used to assess the impacts of the Proposed Scheme alone;
- for the assessment of the Proposed Scheme in combination with other plans and projects, a different without scheme scenario is used and described as the 'do nothing' scenario. This uses traffic data from the 2018 baseline, but background pollutant concentrations/ deposition rates and emission factors representing the future year being assessed;
- the assessment incorporates HS2 Ltd's policy on construction vehicle emissions standards. These standards are published in Information Paper E31; Air Quality and include Euro VI for HGVs, and Euro 6 and Euro 4 for diesel and petrol Light Duty Vehicles (LDV) respectively;
- in-combination effects are largely taken into account in the traffic data used for the assessment which incorporates likely changes brought about by other proposed and committed developments[31]; and
- consideration is also given to relevant non-road plans and projects.

[31] A number of strategic traffic models have been sourced from key stakeholders, including Local Highway Authorities and Highways England. In-combination, these models cover the areas that are expected to be affected by the proposed scheme and have been used as the basis of assessment for traffic flow analysis. The models have been developed by the relevant stakeholders in accordance with Transport Analysis Guidance (TAG) provided by the Department for Transport, with each model representing a base year position between 2016 and 2018.

Forecast year models have also been supplied by the above stakeholders which reflect committed and planned changes to the transport network and growth associated with committed and planned developments that are sufficiently certain to be introduced after the base year of the strategic model. Reviews of committed developments will have been undertaken by the relevant stakeholders at the same time as preparing and validating the base year model and developing future year models. Given that the models represent a base year position between 2016 and 2018, it is likely that the reviews of forecast committed developments will have been undertaken between 2016 and 2018 depending on when each model was last updated.

In order to account for traffic growth from 2018 to future years, growth factors were directly obtained from TEMPro version 7.2 which uses the National Trip End Model (NTEM 7.2 ((2017)) dataset and the National Transport Model (NTM) 2015. TEMPro inherently incorporates future planned development, being based on approved plans, irrespective of whether it is approved, committed, or simply included in approved plans. It includes all economic and population growth forecasts, and assumes growth in housing and commercial development, therefore providing a prediction of traffic growth by area.

3 Air quality standards

Air quality limit values and objectives are quality standards for clean air and to protect human health or harm to vegetation. The term 'air quality standards' will be used to refer to both the English air quality objectives and the air quality limit values and critical levels introduced in the UK based on EU Directives. Table A1 sets out the air quality standard for NO_x.

Table A1: Air quality standards

Pollutant	Averaging period	Standard
NO_x (for protection of vegetation)	Annual mean	30µg/m^3

For the assessment of changes in nitrogen, comparison has been made against the applicable lower critical load for the site, as provided by APIS.

4 How significance is assessed

For the assessment of NO_x concentrations, the effect is considered to be not significant if the total predicted NO_x concentrations are below the air quality standard of 30µg/m^3.

For the assessment of nitrogen deposition, if the change in nitrogen deposition is predicted to be less than 1% of the lower critical load, then the effect is considered to be not significant. However, should the nitrogen deposition change by more than 1%, then the assessment of significance will be undertaken by an ecologist and reported within Section 3 of the main HRA report.

4.1 Assessment of construction traffic effects – Proposed Scheme alone

Screening of traffic data

The assessment of construction traffic impacts has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2025 – 2037). Traffic data is presented in Table A2.

The screening process identified a total of one road in the area exceeding the screening thresholds. This road is: the M6 junction 16 to 17.

The change in traffic flows is a result of HS2 construction traffic (including construction HGVs and workforce vehicles) using the M6, as well as traffic displaced from other routes in the area by the Proposed Scheme.

Table A2: Traffic data used in modelling (construction phase, Proposed Scheme alone)

Road ID	Start and end coordinates	Annual Average Daily Traffic (AADT)			Change:	Heavy Duty Vehicles (HDV)			Change:
		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	2025 with the Proposed Scheme – 2025 without the Proposed Scheme	2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	2025 with the Proposed Scheme – 2025 without the Proposed Scheme
15041_9308	M6 (SB)	43,467	48,739	50,427	1,688	7,924	8,138	9,024	886
9176_9305	Holmshaw Lane	2,775	2,581	2,559	-22	8	5	4	-1
9191_9192	Nursery Road	432	682	684	2	13	18	19	1
9192_9305	Nursery Road	3,210	3,138	3,112	-26	27	23	23	0
9293_9211	Nursery Road	2,778	2,455	2,428	-27	13	5	4	-1
9306_9192	Nursery Road	2,778	2,455	2,428	-27	13	5	4	-1
9306_9293	Nursery Road	2,778	2,455	2,428	-27	13	5	4	-1
9308_9351	M6 (SB)	43,467	48,739	50,427	1,688	7,924	8,138	9,024	886
9309_9213	M6 (NB)	37,849	41,707	43,500	1,793	7,210	7,151	7,966	815
9330_9309	M6 (NB)	37,849	41,707	43,500	1,793	7,210	7,151	7,966	815

Receptors assessed and background concentrations

Figure A1 presents a detailed map of habitats assessed. Yellow points represent the transect presented in the tables below. Thick blue lines represent the modelled roads.

Table A3 presents the relevant habitat types, backgrounds and critical loads. Because the critical load values for lowland raised bog represent the worst case, only these have been used for the assessment.

Figure A1: A map of the site, assessed roads and modelled receptors

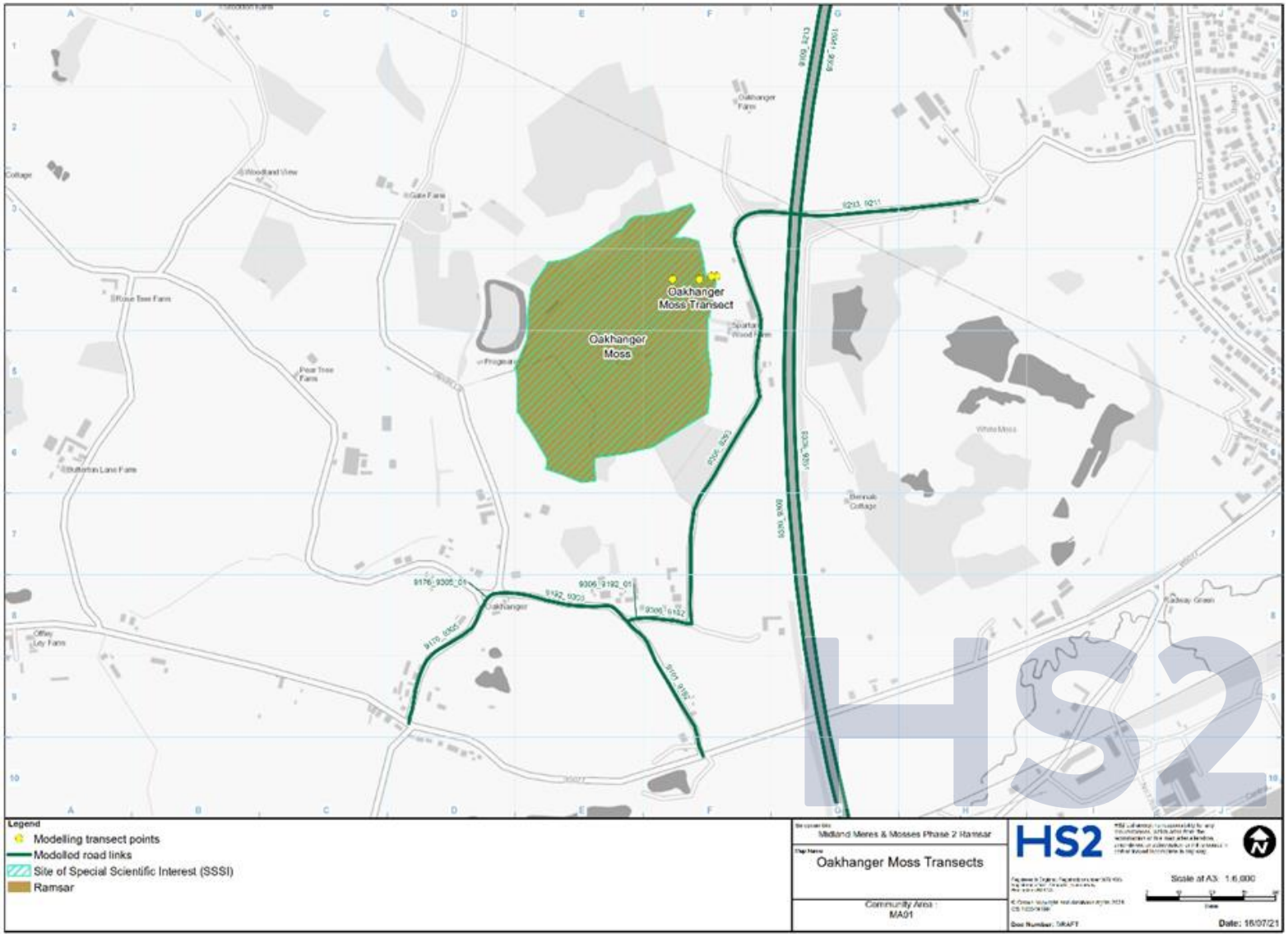


Table A3: Modelled ecological receptor backgrounds, APIS data and critical loads (construction phase)

Receptor	Sensitive habitat	2018 NO_x background concentration (µg/m3)	2025 NO_x background concentration (µg/m3)	APIS data[23] of average total nitrogen deposition	Receptor
Oakhanger Moss	Lowland raised bog	12.7	9.5	31.2	5

Assessment results

Table A4 presents a summary of the modelled NO_x concentrations for the ecological site, the change in concentration and a comparison against the air quality standard (30µg/m^3).

Table A5 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A4: Predicted annual mean of NO_x concentrations at ecological sites (construction phase, Proposed Scheme alone)

Ecological site	Distance to road (m)	Baseline 2018 NO_x concentrations (µg/m^3)	NOx concentrations (µg/m^3)		Change in NO_x concentrations (µg/m^3)	Comparison against air quality standard (30µg/m^3)
			2025 without the Proposed Scheme	2025 with the Proposed Scheme		
Oakhanger Moss	122	29.44	16.99	17.11	0.12	Within standard
	155	26.48	15.60	15.71	0.11	Within standard
	205	23.52	14.24	14.32	0.08	Within standard

Table A5: Assessment of nitrogen deposition at ecological sites (construction phase, Proposed Scheme alone)

Ecological site	Distance to road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2025 without the Proposed Scheme	2025 with the Proposed Scheme			
Oakhanger Moss	122	32.49	31.80	31.81	0.01	5	0.2%
	155	32.27	31.70	31.71	0.01	5	0.2%
	205	32.04	31.59	31.60	0.01	5	0.1%

Assessment of significance

NO_x concentrations at the Oakhanger Moss are predicted to be within the air quality standard in all scenarios.

Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. The change in nitrogen deposition due to the Proposed Scheme is predicted to be less than 1% of the lower critical load and therefore not significant.

4.2 Assessment of construction traffic effects – Proposed Scheme in combination with other plans and projects

Screening of traffic data

The assessment of construction traffic impacts has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2025 – 2037). Traffic data is presented in Table A6.

The screening process identified one road in the area exceeding the screening thresholds: the M6 junction 16 to 17.

Table A6: Traffic data used in modelling (construction phase, Proposed Scheme in-combination)

Road ID	Start and end coordinates	Annual Average Daily Traffic (AADT)			Change 2025 with the Proposed Scheme – 2018 baseline	Heavy Duty Vehicles (HDV)			Change 2025 with the Proposed Scheme – 2018 baseline
		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	
15041_9308	M6 (SB)	43,467	48,739	50,427	**6,961**	7,924	8,138	9,024	**1,100**
9176_9305	Holmshaw Lane	2,775	2,581	2,559	-215	8	5	4	-4
9191_9192	Nursery Road	432	682	684	251	13	18	19	5
9192_9305	Nursery Road	3,210	3,138	3,112	-98	27	23	23	-4
9293_9211	Nursery Road	2,778	2,455	2,428	-349	13	5	4	-9
9306_9192	Nursery Road	2,778	2,455	2,428	-349	13	5	4	-9
9306_9293	Nursery Road	2,778	2,455	2,428	-349	13	5	4	-9
9308_9351	M6 (SB)	43,467	48,739	50,427	**6,960**	7,924	8,138	9,024	**1,100**
9309_9213	M6 (NB)	37,849	41,707	43,500	**5,651**	7,210	7,151	7,966	756
9330_9309	M6 (NB)	37,849	41,707	43,500	**5,651**	7,210	7,151	7,966	756

Non-road plans and projects

No non-road plans or projects have been identified that require further consideration within the in-combination assessment.

Receptors assessed and background concentrations

Figure A1 presents a detailed map of the modelled area including assessed roads (road network in blue, haul roads in green) and modelled receptors (yellow dots).

Table A7 presents the relevant habitat types, backgrounds and critical loads. Because the critical load values for lowland raised bog represent the worst case, only these have been used for the assessment.

Table A7: Modelled ecological receptor backgrounds, APIS data and critical loads (in-combination construction phase)

Receptor	Sensitive habitat	2018 NO_x background concentration ($\mu g/m^3$)	2025 NO_x background concentration ($\mu g/m^3$)	APIS data[23] of average total nitrogen deposition	Receptor
Oakhanger Moss	Lowland raised bog	12.7	9.5	31.2	5

Assessment results

Table A8 presents a summary of the modelled NO_x concentrations for the ecological site, the change in concentration and a comparison against the air quality standard ($30\mu g/m^3$).

Table A9 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A8: Predicted annual mean of NO_x concentrations at ecological sites (construction phase, Proposed Scheme in-combination)

Ecological site	Distance to road (m)	Baseline 2018 NO_x concentrations ($\mu g/m^3$)	NO_x concentrations ($\mu g/m^3$)		Change in NO_x concentrations ($\mu g/m^3$)	Comparison against air quality standard ($30\mu g/m^3$)
			2025 do nothing	2025 with the Proposed Scheme		
Oakhanger Moss	123	29.44	16.35	17.11	0.76	Within standard
	155	26.48	15.07	15.71	0.64	Within standard
	205	23.52	13.81	14.32	0.51	Within standard

Table A9: Assessment of nitrogen deposition at ecological sites (construction phase, Proposed Scheme in-combination)

Ecological site	Distance to road (m)	Baseline 2018 dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2025 do nothing	2025 with the Proposed Scheme			
Oakhanger Moss	123	32.49	31.76	31.81	0.05	5.0	1.2%
	155	32.27	31.65	31.71	0.06*	5.0	1.0%
	205	32.04	31.56	31.60	0.04	5.0	0.8%

*Note: * slight increase compared to 123m Transect point due to rounding*

Assessment of significance

NO_x concentrations at the Oakhanger Moss are predicted to be within the air quality standard in all scenarios.

Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. Predicted nitrogen deposition rates in 2025, with the Proposed Scheme, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition between the 2025 do nothing scenario and with the Proposed Scheme scenario are greater than 1% of the relevant critical up to approximately 155m from the nearest road. Potentially significant effects are therefore predicted, and this is addressed further in Section 3.5 of the main HRA report.

4.3 Assessment of operational traffic effects

Screening of traffic data

The Proposed Scheme will not change traffic movements on roads within 200m of Oakhanger Moss in the operation phase and therefore no further assessment is required.

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